

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 6,880,386 B1
DATED : April 19, 2005
INVENTOR(S) : Hans-Ulrich Krotil et al.

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It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Title page should be deleted and substitute therefor the attached title page.

Replace sheets 1 through 12, showing Figs. 1 through 13D, with attached sheets 1 through 12 showing Figs. 1 through 13D.

Signed and Sealed this

Thirteenth Day of September, 2005



JON W. DUDAS
Director of the United States Patent and Trademark Office

(12) United States Patent
Krotil et al.(10) Patent No.: US 6,880,386 B1
(45) Date of Patent: Apr. 19, 2005

(54) METHOD AND DEVICE FOR SIMULTANEOUSLY DETERMINING THE ADHESION, FRICTION, AND OTHER MATERIAL PROPERTIES OF A SAMPLE SURFACE

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(73) Assignee: Witec Wissenschaftliche Instrumente und Technologie GmbH, Ulm (DE)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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PCT Pub. Date: Jul. 13, 2000

(30) Foreign Application Priority Data

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G01N 19/04; G01B 11/30; G01B 21/30

(52) U.S. Cl. 73/105

(58) Field of Search 73/105, 9, 866,
73/801; 250/306-307

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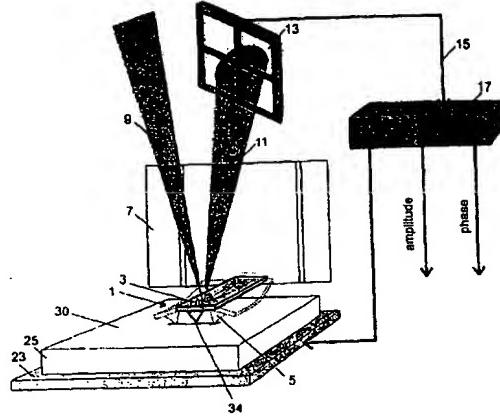
Primary Examiner—Thomas P. Noland

(74) Attorney, Agent, or Firm—Baker & Daniels

(57) ABSTRACT

A process for the location-resolved simultaneous detection of the adhesion and friction as well as possibly of other material properties of a sample surface to be examined by means of a raster probe microscope comprising a raster probe. The raster probe and/or the sample with sample surface are moved until at a point of the sample surface to be examined the raster probe interacts in a determined manner with this surface. The raster probe and/or the sample are subjected to a vertical oscillation, and a first measuring signal characterized by the deformation of the raster probe is recorded. A second measuring signal characterizing the deformation of the raster probe is recorded, wherein the raster probe and/or the sample are subjected to a horizontal and/or vertical oscillation. From these two measuring signals the desired material properties are determined. For the detection of the entire surface area to be examined the raster probe and/or the sample are again moved and for the repetition of the measuring process described brought into contact with the sample surface in the above described manner.

10 Claims. 12 Drawing Sheets

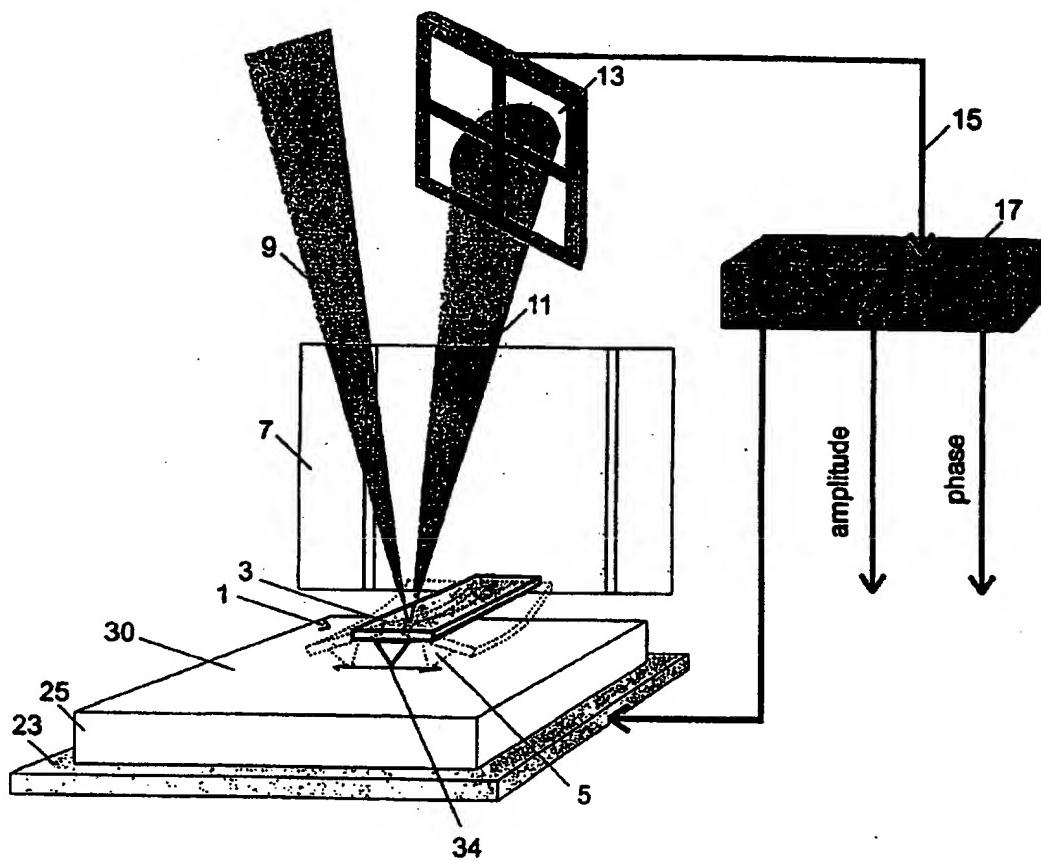


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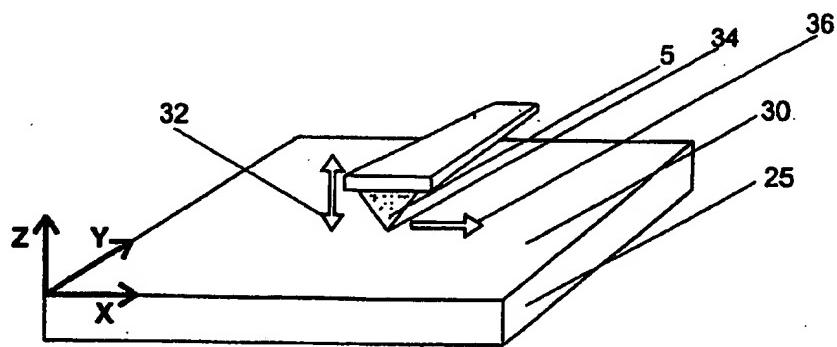


Fig. 2

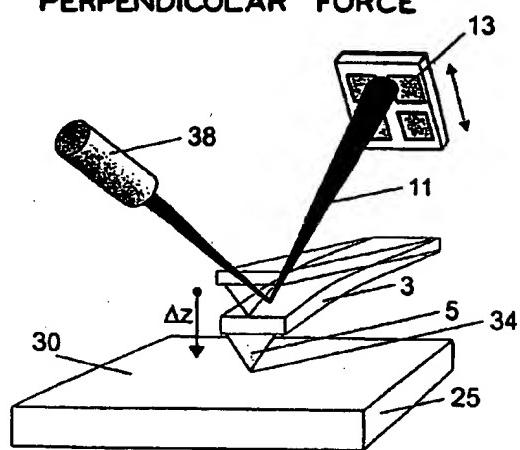
NORMAL
PERPENDICULAR FORCE

Fig. 3A

LATERAL FORCE

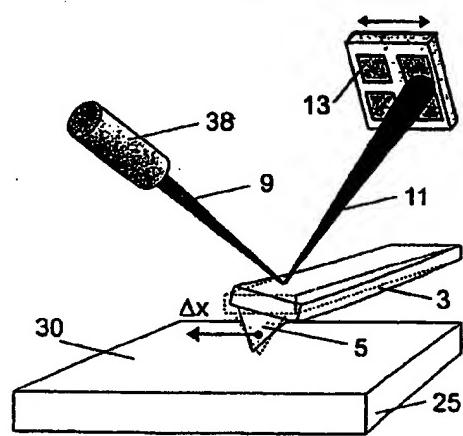


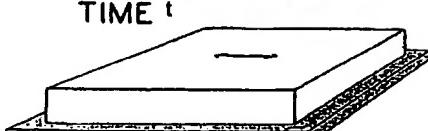
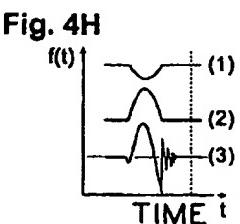
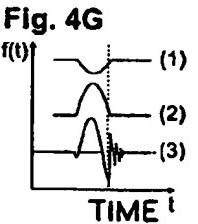
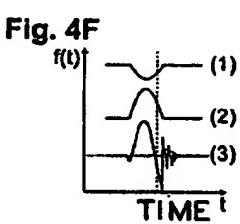
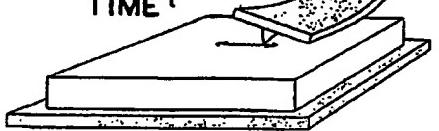
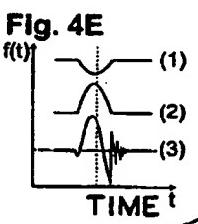
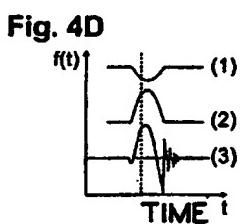
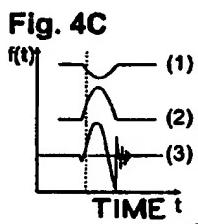
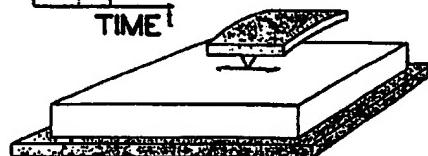
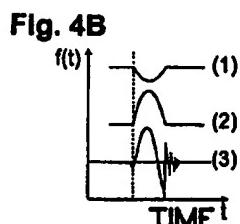
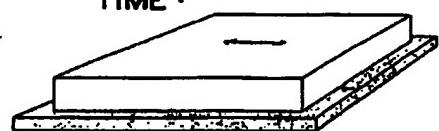
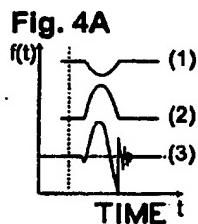
Fig. 3B

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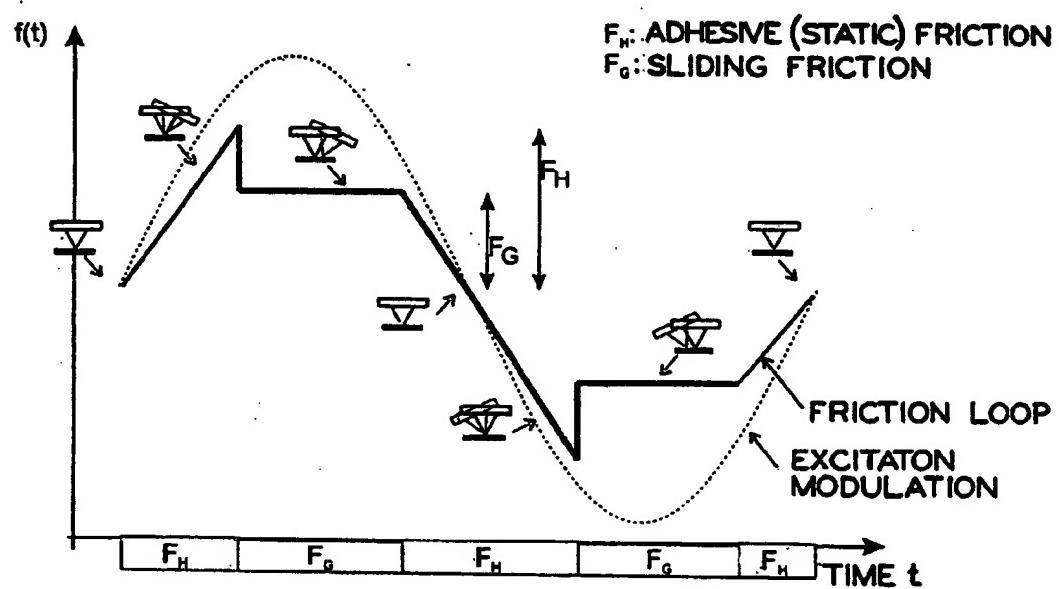
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6,880,386 B1**Fig. 5**

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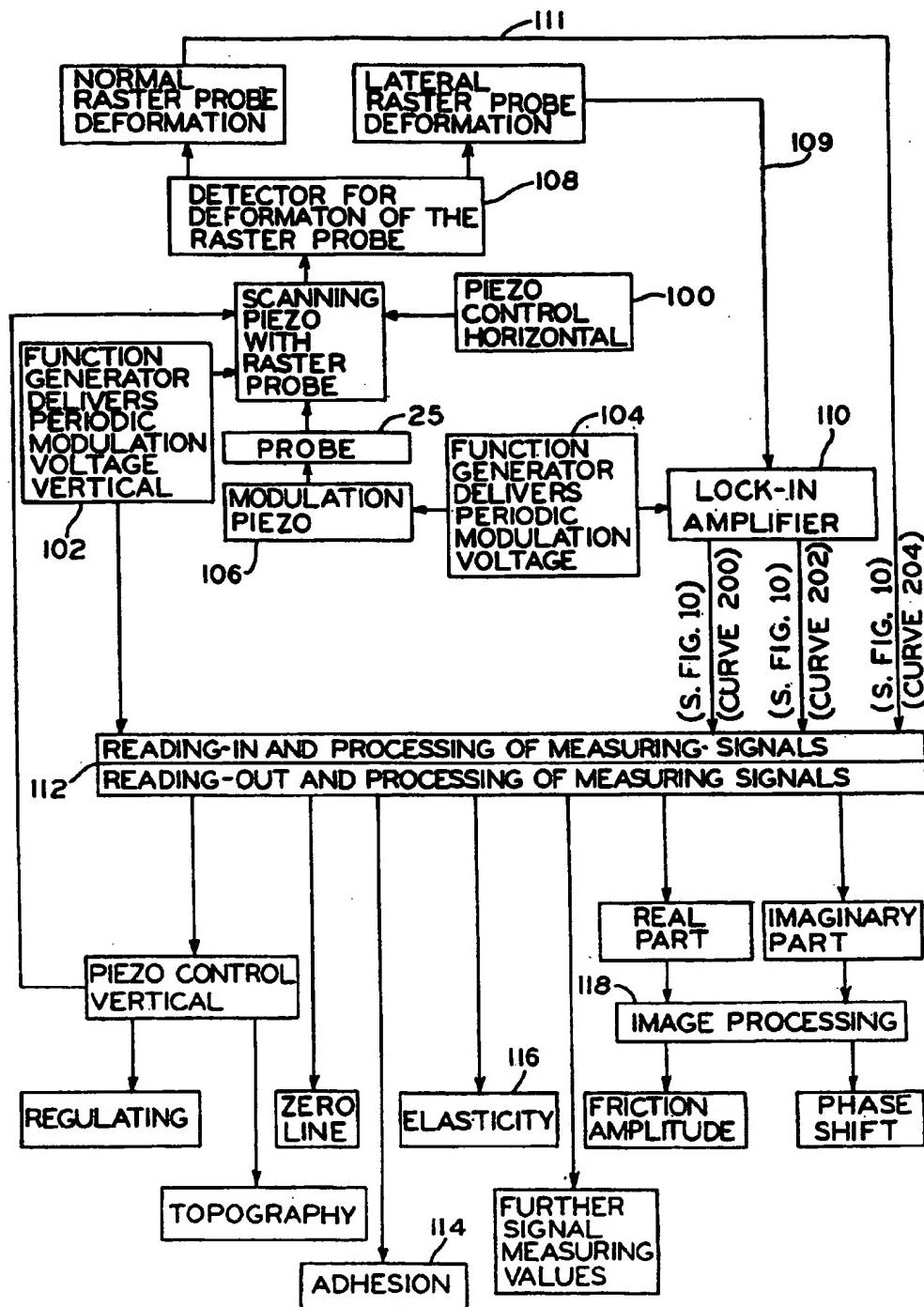


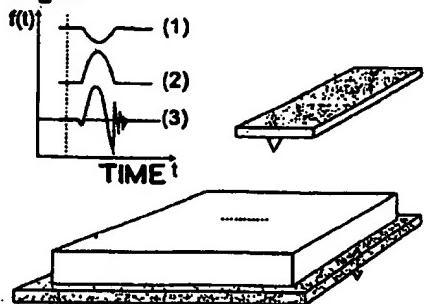
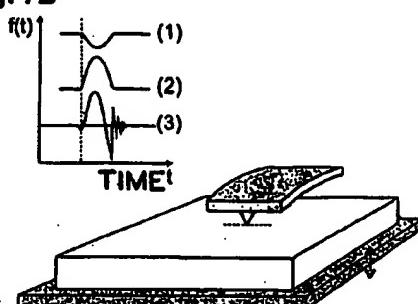
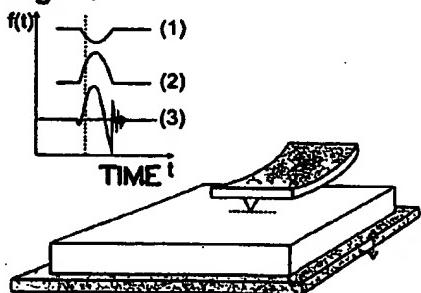
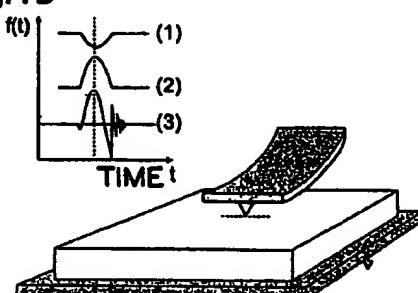
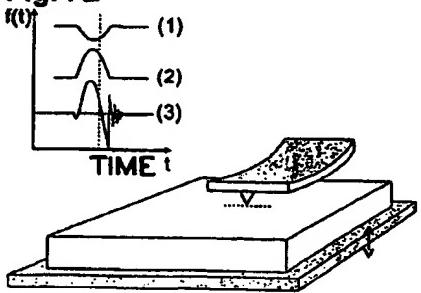
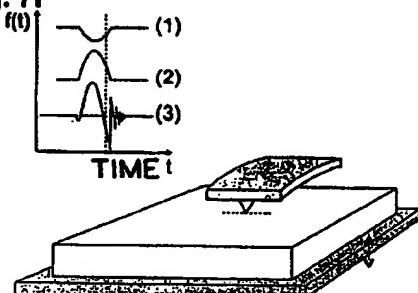
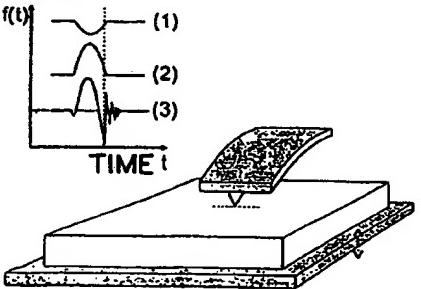
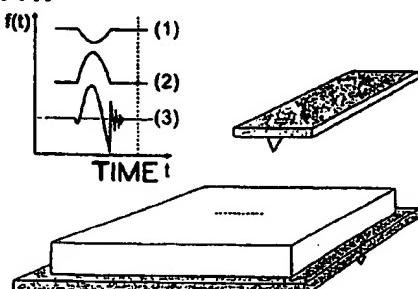
FIG. 6

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Fig. 7A**Fig. 7B****Fig. 7C****Fig. 7D****Fig. 7E****Fig. 7F****Fig. 7G****Fig. 7H**

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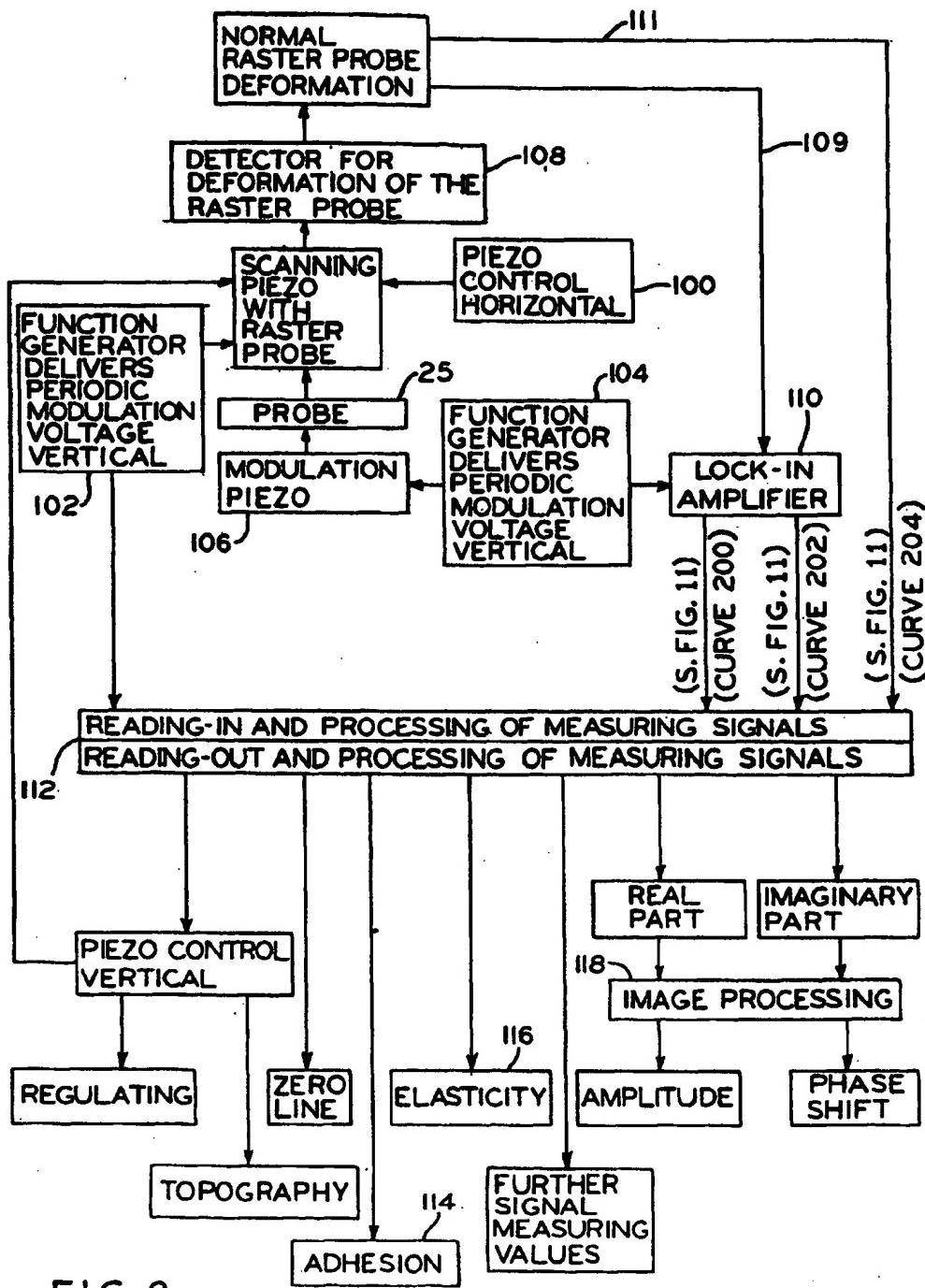


FIG. 8

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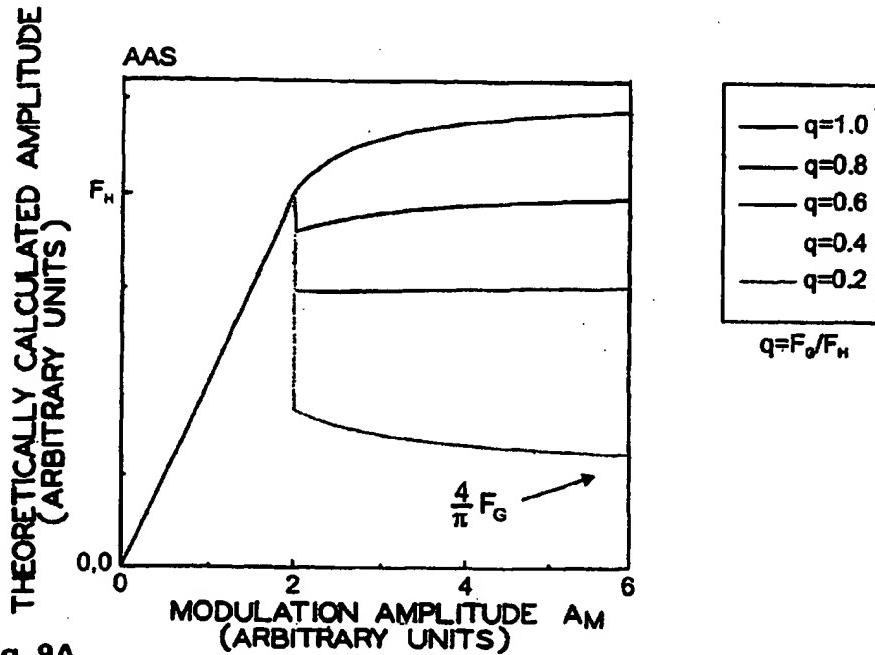
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Fig. 9A

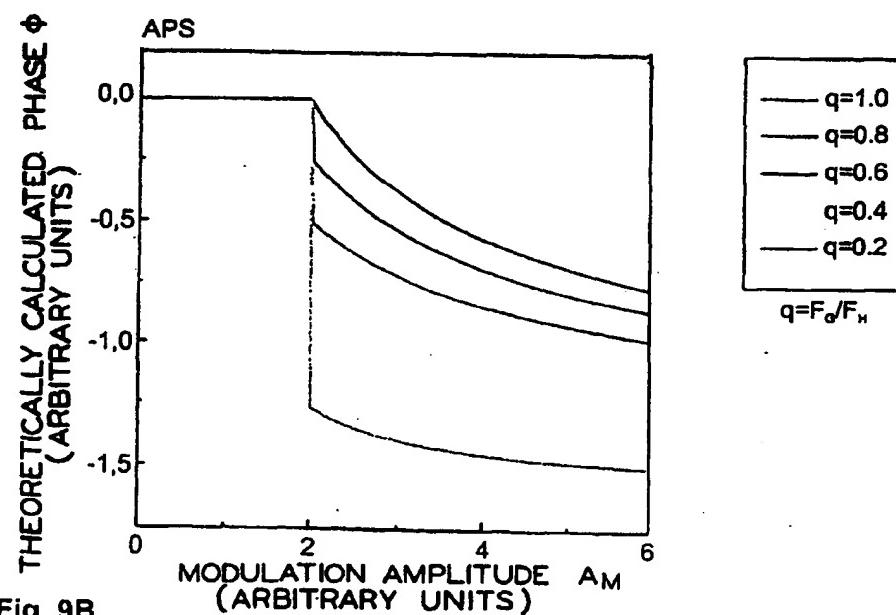


Fig. 9B

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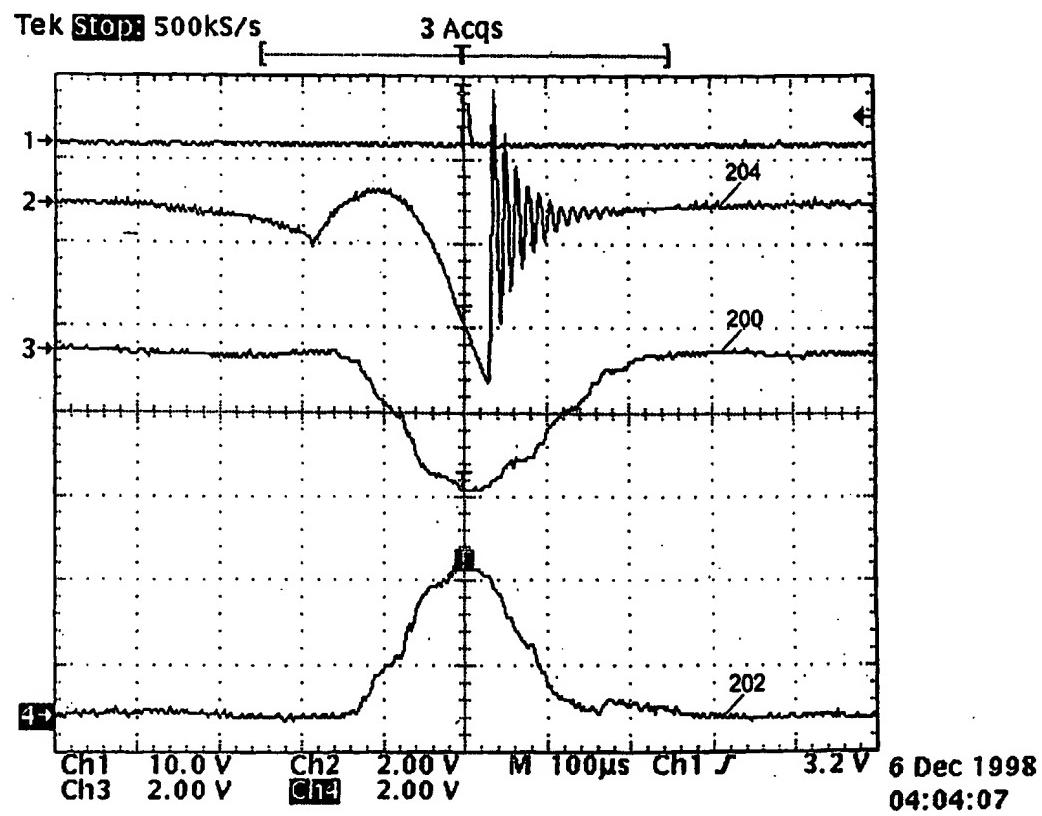


Fig. 10

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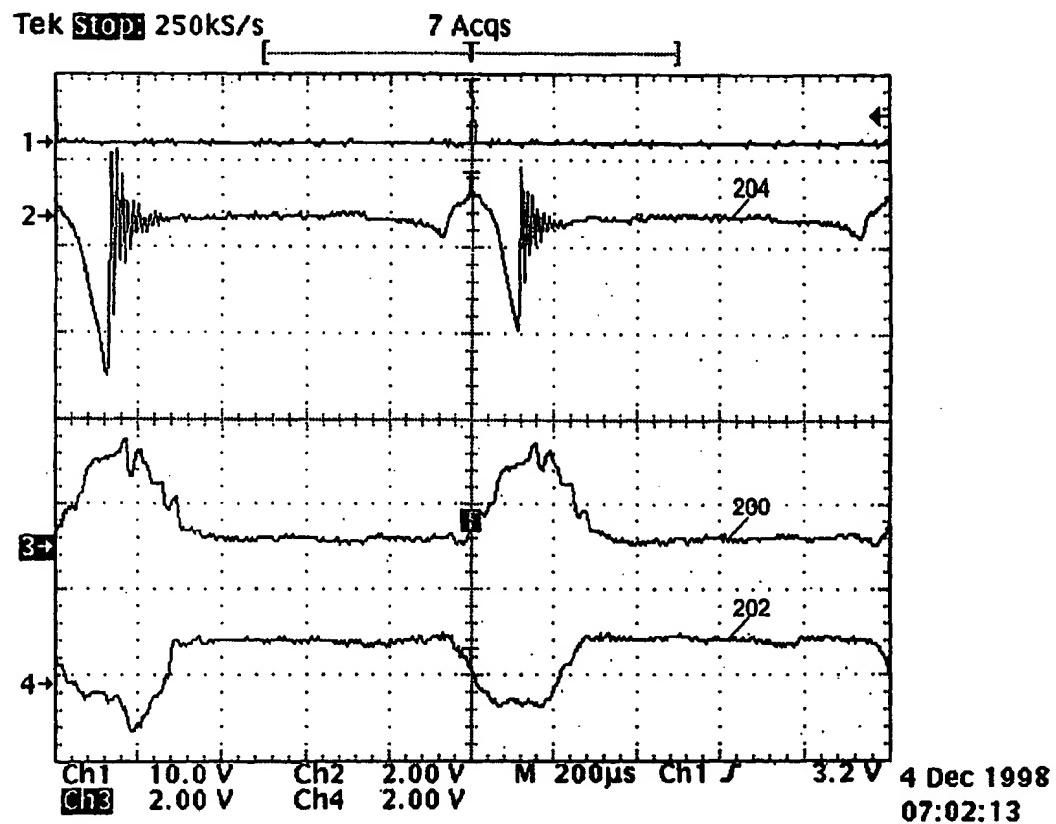


Fig. 11

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POLYMER SAMPLE,
IMAGE SIZE $25\mu\text{m}^2$,
93kHz / 1kHz

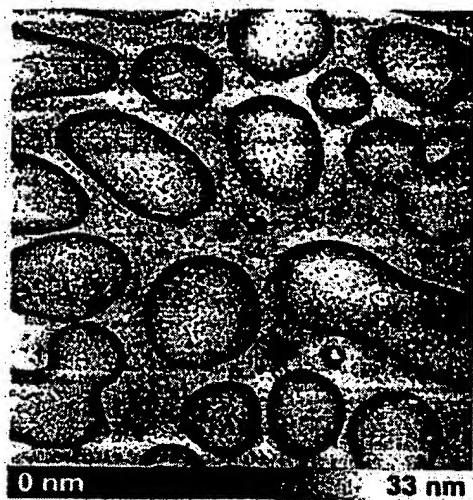


Fig.12A

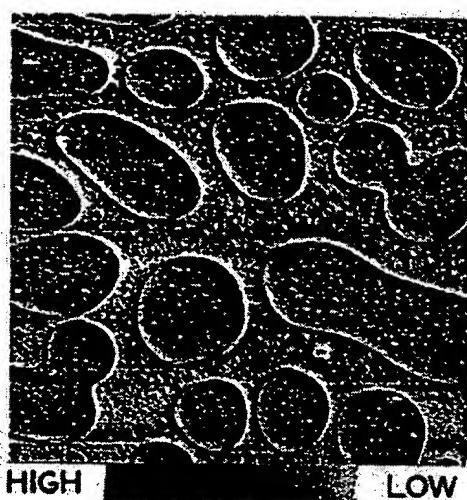


Fig.12B

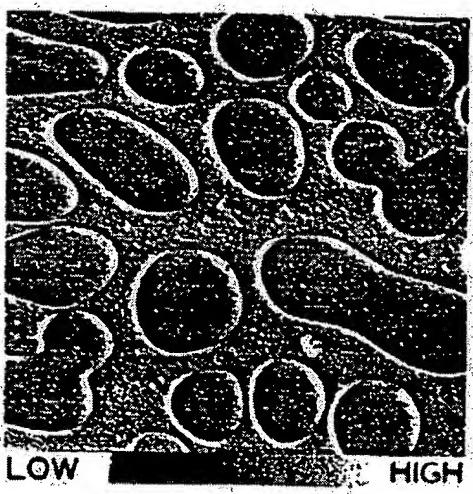


Fig.12C

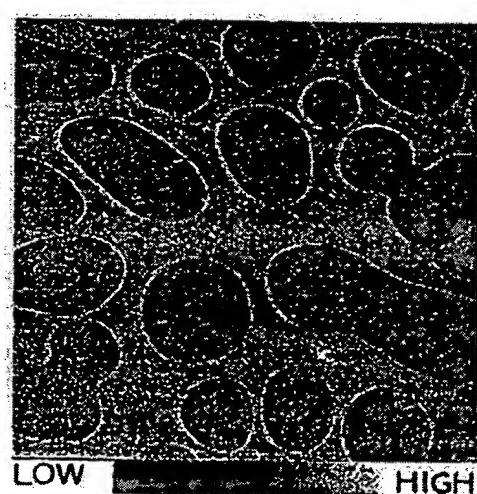


Fig.12D

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POLYMER SAMPLE,
IMAGE SIZE 25 μm^2 ,
230kHz / 1kHz

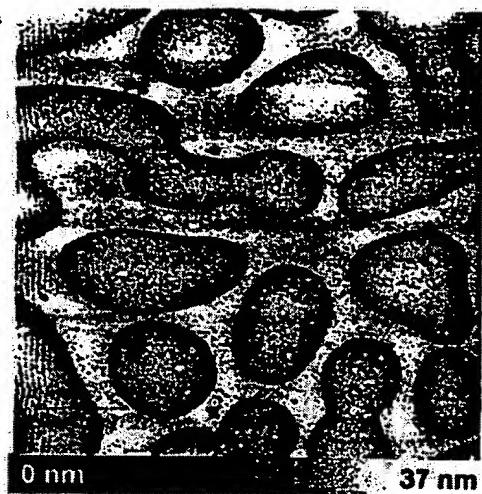


Fig.13A

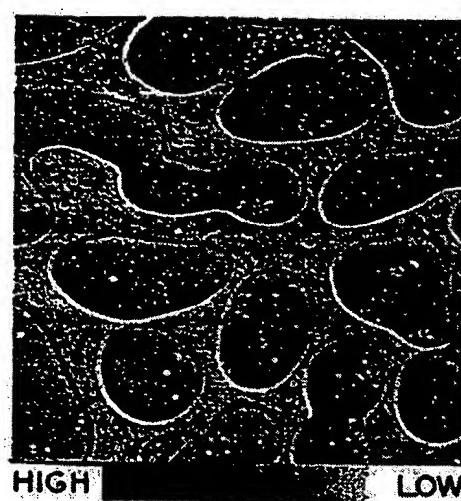


Fig.13B

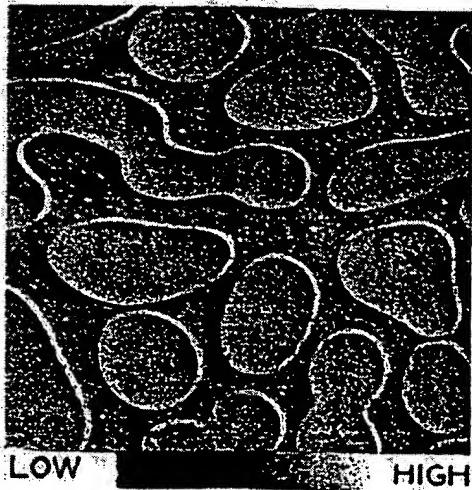


Fig.13C

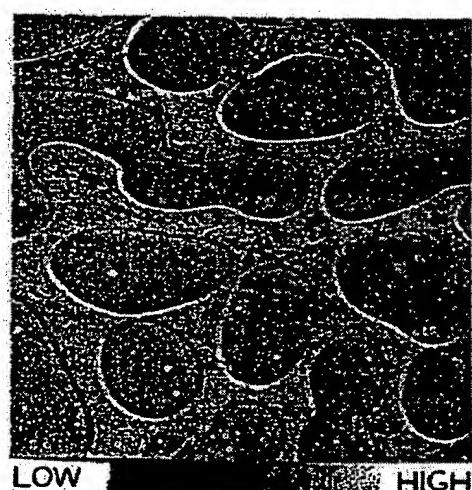


Fig.13D

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